Year 1 Nutrient Monitoring for the County of Los Angeles Unincorporated Area of the Machado Lake Watershed

Submitted to:

California Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013-2343

Submitted by:

County of Los Angeles
Department of Public Works
900 South Fremont Avenue
Alhambra, CA 91803-1331

APRIL 25, 2013

Table of Contents

List of Figures

List of Tables

Introduction

The Machado Lake Nutrient Total Maximum Daily Load (TMDL) was developed by the Los Angeles Regional Water Quality Control Board (Regional Board) and adopted on May 1, 2008. The U. S. Environmental Protection Agency (USEPA) approved the TMDL on March 11, 2009, and the approval letter was posted on April 8, 2009. The Machado Lake Nutrient TMDL was developed to address the nutrient-related beneficial use impairments identified for Machado Lake, including the following Section 303(d) listings: eutrophication, algae, ammonia, and odor.

The Machado Lake Nutrient TMDL set concentration-based waste load (WLAs) for in-lake or end-of-pipe compliance options. At the same time, it provides for a mass-based compliance option, with the condition that the parties who choose this option develop the equivalent mass-based WLA and method of compliance with the WLA through a Special Study. The County has opted for the mass-based WLA alternative and completed the Special Study called "*Machado Lake Nutrient TMDL Special Study: Characterization of Water Quality Conditions in the Unincorporated Areas of Los Angeles County within the Machado Lake Watershed, Final Report*" dated September 12, 2011.

The County submitted a *"Machado Lake Multipollutant TMDL Monitoring and Reporting Program (MRP)"*and *"MRP Quality Assurance and Project Plan (QAPP*) *for the Unincorporated Areas of Los Angeles County within the Machado Lake Watershed*" on September 12, 2011 to the Regional Board as required per the TMDL. The MRP and the QAPP specify both Wet weather and Dry weather sampling criteria and protocol. On April 25, 2012, the Regional Board provided approval for the nutrient portion of the MRP and QAPP.

As described in the MRP a total of seven monitoring sites were selected; three of which were dedicated for water quality sampling and measurements of field parameters (for both Wet and Dry weather events) and the remaining four sites for only field measurements (no water sampling required). The total number of sampling events for Year 1 Nutrient Monitoring for Wet Weather is three (3) and Dry Weather events are three (3) per the Regional Board, via email notification, time stamped Wednesday, May 30, 2012 at 4:05 PM from Kangshi (Kenny) Wang (kwang@waterboards.ca.gov) to William Johnson (wjohnson@dpw.lacounty.gov).

Description of Monitoring Sites and Events

The Unincorporated County Islands within the Machado Lake watershed are located on Figure 1. Seven monitoring sites located at the inlets or outlets of the three County Islands, namely; County Islands 1, 2 and 3 are identified in the approved MRP and QAPP. The selected monitoring sites are described in Table 1, with monitoring locations in County Islands 1 and 2 displayed in Figure 2, and monitoring locations in County Island 3 displayed in Figure 3. The area drained corresponding to each monitoring site and the majority land use of the portion of the County Island corresponding to each site are presented in Table 2. Drainage areas were determined using GIS layers of detailed basins and flow paths of the Machado Lake watershed provided by the County.

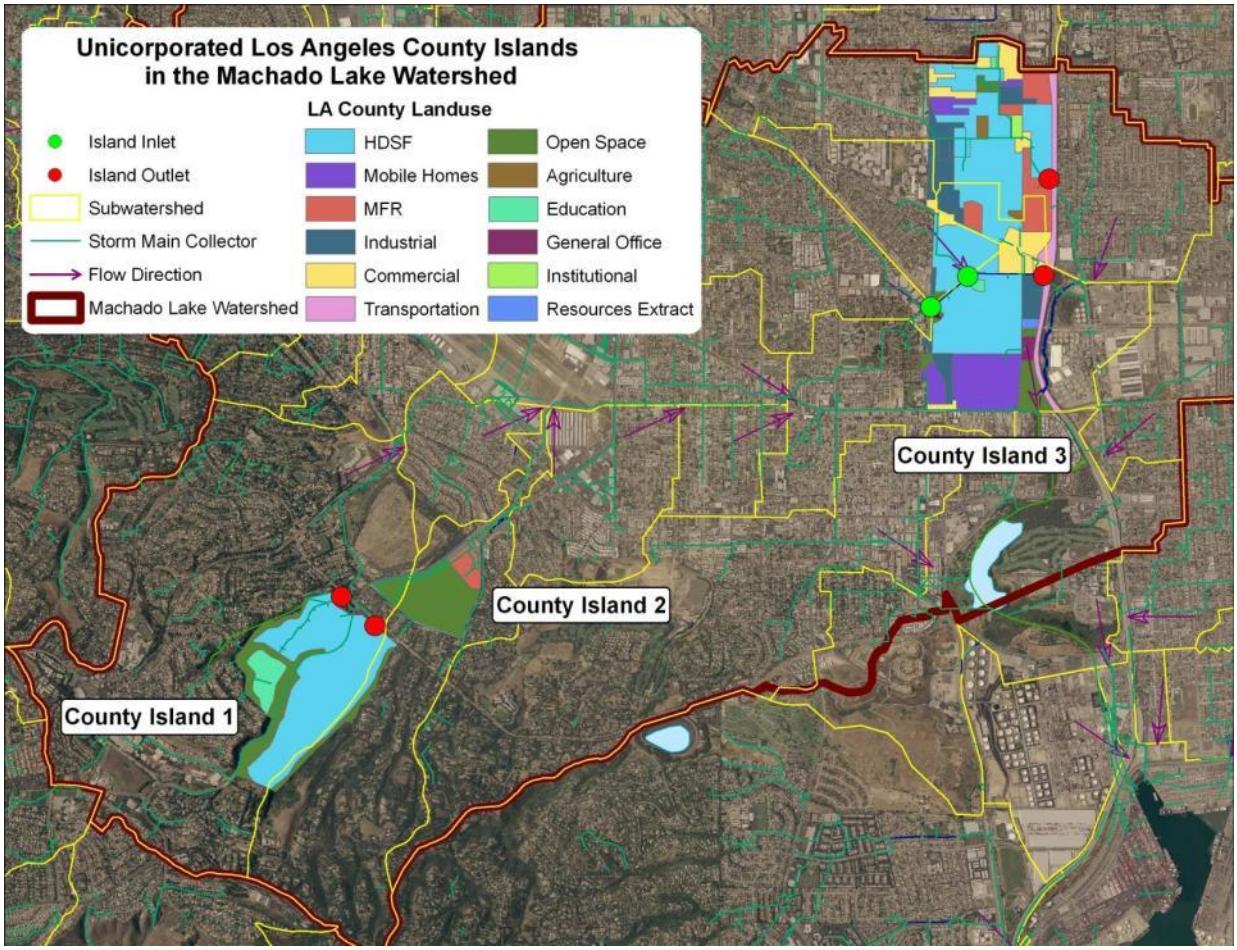

Figure 1. Overview of County Islands and Monitoring Sites.

Table 1. Monitoring Site Descriptions.

SiteID	County Island	Type	Nearest Intersection	Latitude	Longitude	Description
1O_ACAD	1	Outlet	Academy Dr. & Palos Verdes Dr.	33.7831	-118.3537	Representative of County Island outlet and potentially residential land use. This site will be used to characterize loading from the County Island and residential land uses.
1O_EAST	1	Outlet	Eastvale Rd.&Palos Verdes Dr.	33.7809	-118.3506	Representative of County Island outlet and residential land use. This site will be used to characterize loading from the County Island and residential land uses.
2O_SCGB[(1)]	2	Outlet	Crenshaw Blvd. & Palos Verdes Dr.	33.7844	-118.3441	Outlet of the South Coast Botanic Garden, the majority landuse of the Island.
3I_NORMP	3	Inlet	Normandie Ave.& Pasatiempo Ln.	33.8058	-118.2989	Large drain into County Island. Associated Vermont/Sepulveda outlet drains large portion of County Island. This site will be used to characterize loading to the County Island and evaluate loadings to other portions of the County without an associated inlet site.
3I_ASHB	3	Inlet Proxy	Ashbridge Dr.& Pasatiempo Ln.	33.8082	-118.2954	Drains the combination of the two other small Island inlets to the associated Vermont/Sepulveda Island outlet. This site will be used to characterize loading to the County Island.
3O_VERSEP	3	Outlet	Vermont Ave.& Sepulveda Blvd.	33.8083	-118.2883	Drains large section of County Island. This site will be used to characterize loading from the County Island and evaluate loadings from other portions of the County without an associated outlet site.
3O_VAND	3	Outlet	Van Deene Ave.& 228th St.	33.8158	-118.2878	Drains large section of County Island. This site will be used to characterize loading from the County Island and evaluate loadings from other portions of the County without an associated outlet site.

[1] Location may be modified to facilitate storm sampling equipment

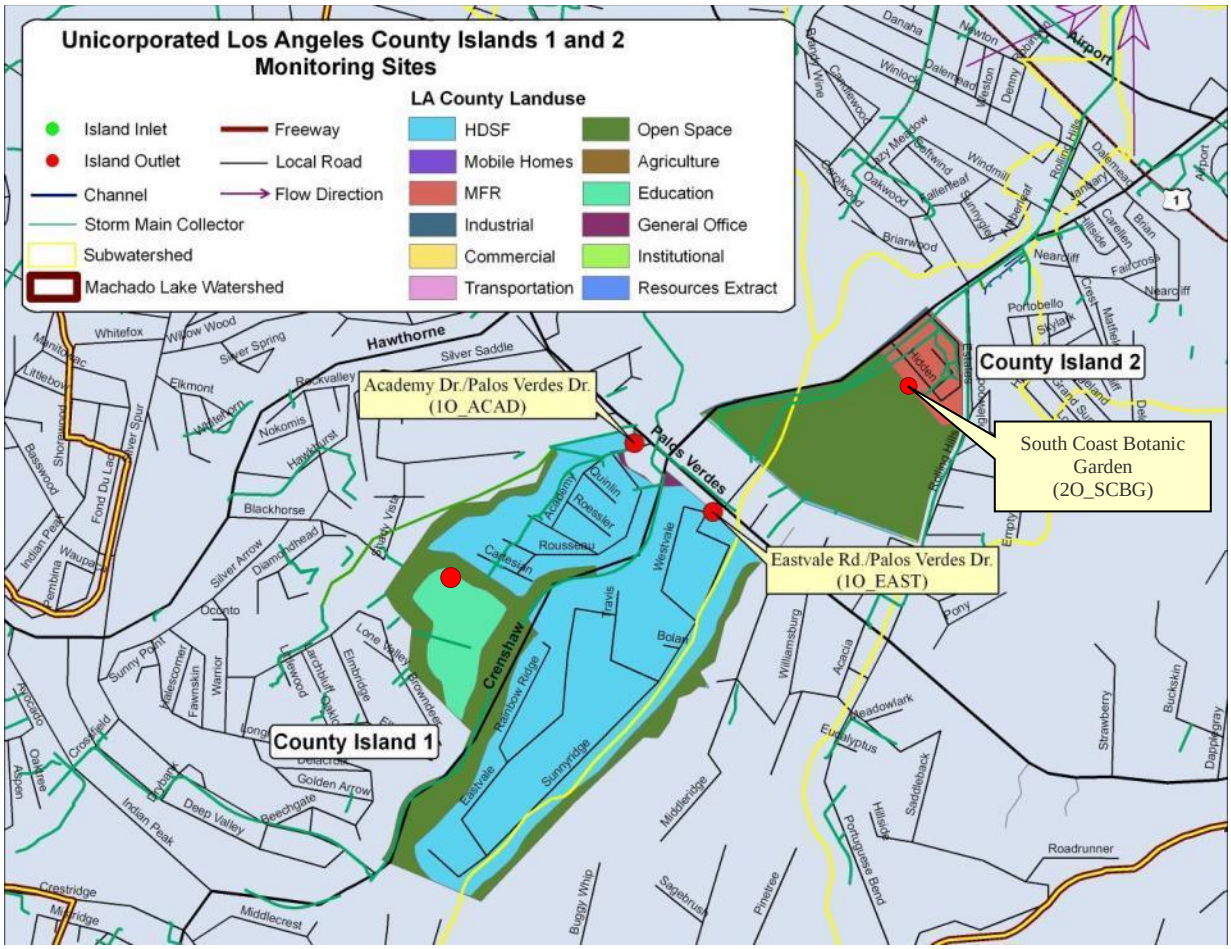

Figure 2. Monitoring Sites on County Islands 1 and 2.

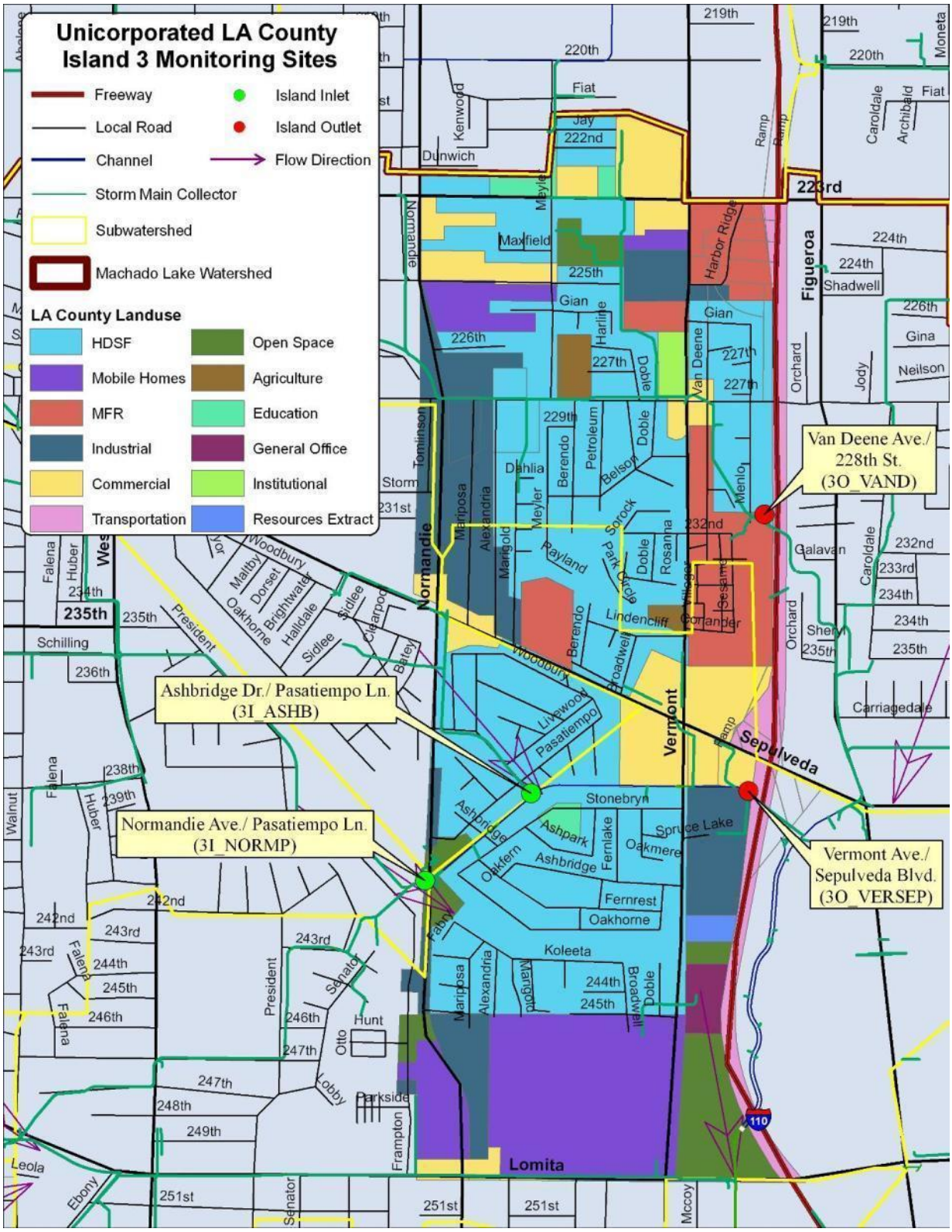

Figure 3. Monitoring Sites on County Island 3.

Table 2. Monitoring Site Drainage Areas and Majority Land Use.

SiteID	Type	Acres Drained			% of Total Drainage Area Draining County Land	Majority County Land Use Drained
		County	Upstream of County	Total		
1O_ACAD	Outlet	61	0	61	100%	Residential - 65% [HDSF - 65%]
1O_EAST	Outlet	54	0	54	100%	Residential - 99% [HDSF - 99%]
2O_SCBG	Outlet	87	0	87	100%	Open Space
3I_NORMP	Inlet	45[(1)]	1,330	1,375	NA	NA
3I_ASHB	Inlet Proxy	48[(1)]	197	244	NA	NA
3O_VERSEP	Outlet	291	1,527	1,818	16%	Residential - 70% [HDSF - 61% MFR - 5% Mobile Homes - 4%]
3O_VAND	Outlet	339	326	665	51%	Residential - 69% [HDSF - 51% MFR - 14% Mobile Homes - 4%]

[1] Complex drainage pattern results in a small area of County land draining to site.
[2]NA – Not Applicable - Inlet sites are not intended to measure County inputs.

The total areas, and impervious cover for each County Island are presented in Table 3. Loads of nutrients calculated for the areas corresponding to sampling locations outlined in Table 2 will be scaled by the areas in Table 3 to determine the total load from the County Islands, a method of calculation consistent with the nutrient waste load calculation.

Table 3. Summary of County Islands in the Machado Lake Watershed.

County Island	Acreage	Average Percent Impervious Cover	Acreage of Impervious Cover
Island #1	335	37	124
Island #2	105	27	28
Island #3	812	64	520
Total	1252	54	672

YEAR 1 SAMPLING EVENTS

The sampling schedule for the first four years of the nutrient monitoring is outlined in the MRP. Dry weather nutrient sampling is to occur generally quarterly at the two selected outlet monitoring sites from County Islands 1 and 3. No dry weather sampling is anticipated within County Island 2 as dry weather flows historically have not been observed from Island 2;

however, site visits are conducted during each dry weather event to verify that there are no dry weather flows. For Year 1, the MRP approval became effective mid-year, precluding a full four quarters of data collection. On May 30, 2012, the Regional Board acknowledged and approved three quarters of dry weather sampling for the first year of the monitoring program. After four years, the data collected will be evaluated in advance and support of a reopener of the TMDL scheduled to occur prior to September 2016 to allow a reassessment of the monitoring frequency.

Table 4. Summary of Nutrient TMDL Sampling.

		Year 1		Year 2		Year 3		Year 4		Year 5[(1)]	
Site ID	Constituents	Wet	Dry[(2)]	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
1O_ACAD	Nutrients	3	3	3	4	3	4	1	4	TBD	TBD
2O_SCBG	Nutrients	3	-	3	-	1	-	-	-	TBD	TBD
3O_VAND	Nutrients	3	3	3	4	3	4	1	4	TBD	TBD

[1] Nutrient sampling to be determined (TBD) in year 5 based on data review.
[2] Year 1 Monitoring began June 2012 limiting potential sampling to 3 quarterly events.

Dry Weather Events

Dry Event #1 of the Nutrient Monitoring occurred on September 11, 2012 during dry weather conditions. All seven monitoring sites were visited during the event. Sites 1O_EAST and 2O_SCBG did not have water flow to sample. Field parameters were measured at each site containing sufficient water to sample. Water quality samples were collected at two sites, 1O_ACAD and 3O_VAND. Field-initiated quality control (QC) samples, including field blanks and duplicates, as well as extra volume for matrix spike and matrix spike duplicate samples, were collected at 1O_ACAD. There was no flow from Island 2.

Dry Event #2 of the Nutrient Monitoring occurred on November 15, 2012 during dry weather conditions. All seven monitoring sites were visited during Dry Event #2. Sites 1O_EAST and 2O_SCBG did not have water flow to sample. Field parameters were measured at each site containing sufficient water to sample. Water quality samples were collected at two sites, 1O_ACAD and 3O_VAND. Field-initiated QC samples, including field blanks and duplicates, as well as extra volume for matrix spike and matrix spike duplicate samples, were collected at 3O_VAND. There was no flow from Island 2.

Dry Event #3 of the Nutrient Monitoring was conducted February 01, 2013, during dry weather conditions. All seven sites were visited during the Dry Event #3. Sites 1O_EAST and 2O_SCBG did not have flow to sample. Field parameters were measured at each site containing sufficient water to sample. Water quality samples were collected at two sites, 1O_ACAD and 3O_VAND. The QC field duplicates, and enough additional sample water for the labs to run matrix spikes/ matrix spike duplicates, were collected at 1O_ACAD. The QC field blanks were poured into sample containers at a location just off the roadway, at site 1O_EAST. There was no flow from Island 2.

Wet Weather Events

Note that the 2012-2013 wet season was relatively dry with precipitation levels less than half average amounts. As wet weather flows are dependent on the precipitation levels, the flows

observed in the Year 1 monitoring are likely to be low, in comparison to an average or wet year. The pond upstream from 2O_SCBG did not overflow during the wet season, so there was no measured flow from Island 2.

Wet Event #1 of the Nutrient Monitoring began on December 12 and ended December 13, 2012 during wet and showery weather conditions. All the seven sites were visited during the Wet Event # 1 and field measurements were collected for each site containing sufficient water to sample. Two of the sites, 1O_EAST and 2O_SCBG, had no flows and therefore no water samples and/or field measurements were taken those sites. Water quality samples were obtained from Islands 1 and 3, where there were sufficient flows to allow sample collection. A field initiated quality control field duplicate was poured off from the 1O_ACAD composite sample into a clean sampling container. Quality control matrix spike/matrix spike duplicate samples were run from sample volume collected at 3O_VAND, due to the volume that was available for analysis. There was no flow from Island 2.

Wet Event #2 of the Nutrient Monitoring began on January 24 and ended January 25, 2013 during wet and showery weather conditions. All seven sites were visited during Wet Event # 2. Field parameters were collected for each site containing sufficient water to sample. The composite sampler stolen mid-event from 3O_VAND and therefore only field measurements were taken at this site. Water quality samples were obtained from Island 1. A QC field duplicate sample was poured off from the 1O_ACAD composite sample into a clean sampling container. Quality control matrix spike/matrix spike duplicate samples were run from sample volume collected at 1O_ACAD. There was no flow from Island 2; therefore, no water samples and/or field measurements were taken at this site.

Wet Event #3 of the Nutrient Monitoring began on February 19 and concluded on February 20, 2013 during showery but clearing weather conditions. All seven sites were visited during Wet Event #3. Field parameters were collected for each site containing sufficient water to sample. Two sites, 1O_EAST and 2O_SCBG, had no flows and therefore no water samples and/or field measurements were taken at these sites. Water quality samples were obtained from Islands 1 and 3. For Wet Event #3, field QC data were collected at 3O_VAND and will be referred to as 3O_DUPREE. There was no flow from Island 2.

Constituents and Analytical Methods

The constituents measured, analytical methods, project method detection limits, and project reporting limits are listed in Table 5. Although nutrient WLAs exist for total nitrogen and total phosphorus, multiple nutrient constituents were analyzed to assist in the understanding of nutrient loadings from the County Islands and support identification of methods for reducing those loadings. Additionally, field measurements were collected for the parameters listed in Table 6. A summary of the samples collected during the first year of monitoring is provided in Table 7.

Table 5. Constituents, Analytical Methods, and Detection and Reporting Limits.

Constituent Class	Constituent	Method	Detection Limit	Reporting Limit
Conventional	Total Suspended Solids	SM 2540D	0.5mg/L	1.0 mg/L
	Total Dissolved Solids	SM 2540C	0.1 mg/L	5 mg/L
Nutrients	Total Kjeldahl Nitrogen[1]	EPA 353.2	0.025 mg/L	0.10 mg/L
	Nitrate as Nitrogen[1]	EPA 300.0	0.01mg/L	0.05mg/L
	Nitrite as Nitrogen[1]	SM 4500-NO2 B	0.01 mg/L	0.05 mg/L
	Ammonia as Nitrogen	SM 4500-NH3 D	0.02mg/L	0.06 mg/L
	Total Phosphorus	SM 4500-P E	0.016mg/L	0.05mg/L
	Dissolved Phosphorus	SM 4500-P E	0.016 mg/L	0.05 mg/L
	Total Ortho-phosphate	SM 4500-P E	0.01mg/L	0.02mg/L

[1] Total Nitrogen is the sum of TKN, nitrate, and nitrite.

Table 6. Project Reporting Limits for Field Measurements

Parameter/Constituent	Range	Project RL(1)
Flow	-0.5 to +20 ft^3/s	0.05 ft^3/s
pH	0 – 14 standard units	NA(2)
Temperature	-5 – 50 $^{\circ}C$	NA(2)
Dissolved oxygen	0 – 50 mg/L	0.5 mg/L
Turbidity	0 – 3,000 NTU	0.2 NTU
Conductivity	0 – 10,000µmhos/cm	2.5 µmhos/cm

[1] RL – Reporting Limit
[2]NA – Not Applicable

Field meters used during each event were calibrated prior to the event. Calibration of the meters was verified prior to and following the monitoring event. The field crew verified that the meter calibrated correctly for all parameters being measured.

The Field Log Book and photographs of the sites for the events are compiled in Attachment 1 and Attachment 2, respectively. Samples were submitted to Physis Laboratories for analysis of all conventional parameters and nutrients except for Total Kjeldahl Nitrogen (TKN), which were submitted to Associated Laboratories.

Table 7. Summary of Samples Collected and Sampling Stations.

Sites	Conventionals[1]	Nutrients[2]	Field Measurements[3]
1O_ACAD[4]	*X*	*X*	*X*
1O_EAST	---	---	X
2O_SCBG[4]	*X*	*X*	*X*
3I_NORMP	---	---	X
3I_ASHB	---	---	X
3O_VERSEP	---	---	X
3O_VAND[4]	*X*	*X*	*X*

[1]Conventional: Total Suspended Solids and, Total Dissolved Solids
[2] Nutrients: Total Kjeldahl Nitrogen (TKN), Nitrate as Nitrogen, Nitrite as Nitrogen, Ammonia as Nitrogen, Total Phosphorus, Dissolved Phosphorus, Total Ortho-phosphate
[3]Field Measurements: Flow, pH, temperature, dissolved oxygen, turbidity, and electrical conductivity
[4] Nutrient concentration evaluation site.

Quality Assurance/Quality Control Summary

Quality Assurance/Quality Control (QA/QC) measures are built into the Study to assure data are credible. Field QA/QC for this project includes the following:

- Proper collection, handling, and preservation of samples
- Maintenance of a field log and photographs
- Field Blanks
- Field Duplicates

Laboratory QA/QC for this project includes the following:

- Use of the lowest available method detection limits (MDLs) for trace elements.
- Analysis of method blanks and laboratory duplicates.
- Use of matrix spikes (to test analytical accuracy) and matrix spike duplicates (to test analytical precision) (MS/MSD).
- Routine analysis of standard reference materials (SRMs) and method blanks.

The QA/QC analysis of the Year 1 monitoring data indicated the following:

- **Hold Times:** USEPA analytical hold time guidelines place requirements on sample filtration, preservation, and/or analysis. All hold times were met for all samples.
- **Blank Contamination:** The use of field blanks and method blanks are intended to test whether contamination is introduced from sample collection and handling, sample processing, analytical procedures, or the sample containers. All field and laboratory blanks recorded values that were below the method reporting limits.
- **Precision:** The purpose of analyzing duplicates is to demonstrate precision of sample collection, preparation and analytical methods. All samples met applicable standards defined in the QAPP.

- **Accuracy:** The purpose of analyzing laboratory control samples (or a standard reference material) is to demonstrate the accuracy of the sample preparation and analytical methods. The purpose of analyzing matrix spikes and matrix spike duplicates is to demonstrate the performance of the sample preparation and analytical methods in a particular sample matrix. Recovery limits met the applicable standards defined in the QAPP, with the limited exceptions. Tests not meeting quality objectives include ammonia from Wet Event 3#, where the MS/MSDs both failed for insufficient spike concentrations, nitrate from Dry Event #3 where MS/MSDs both failed for insufficient spike concentrations, and nitrite from Dry Event #3 where MS/MSDs both failed for recovery indicating potential matrix interference.

A summary of QA/QC qualifications is presented in Table 8.

Table 8. Summary of QA/QC Qualifications.

	Dry			Wet		
Constituent	Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Total Suspended Solids	0	0	0	0	0	0
Total Dissolved Solids	0	0	0	0	0	0
Total Nitrogen[1]	0	0	2	0	0	0
Ammonia as Nitrogen	0	0	0	0	0	2 SH[2]
Total Kjeldahl Nitrogen	0	0	0	0	0	0
Nitrate as Nitrogen	0	0	2 SH[2]	0	0	0
Nitrite as Nitrogen	0	0	2 M[3]	0	0	0
Total Phosphorus	0	0	0	0	0	0
Dissolved Phosphorus	0	0	0	0	0	0
Total Ortho-phosphate	0	0	0	0	0	0

[1] Total Nitrogen is the sum of TKN, nitrate, and nitrite. Qualifications listed are for the components of Total Nitrogen.
[2] Insufficient Spike Concentration
[3] Potential Matrix Interference

DUPLICATE RESULTS

The duplicate results for samples collected at 1O_ACAD are compared to measured results in Table 9, and duplicate results are compared to measured results for 3O_VAND in Table 10.

Table 9. Duplicate Analytical Chemistry Results from 1O_ACAD.

	Dry Event #1		Dry Event #3		Wet Event #2	
Constituent (mg/L)	Dry #1	Duplicate	Dry #3	Duplicate	Wet #2	Duplicate
Total Suspended Solids	30	22	ND	ND	15.9	13.1
Total Dissolved Solids	1290	1100	849	830	431	429
Total Nitrogen[(1)]	5.0	5.0	1.6	ND	3.0	2.82
Ammonia as Nitrogen	0.32	0.24	0.08	1.3	0.13	0.16
Total Kjeldahl Nitrogen	1.2	1.4	0.40	ND	2.1	1.9
Nitrate as Nitrogen	3.8	3.6	1.2	1.3	0.93	0.92
Nitrite as Nitrogen	0.02J[(2)]	0.02	ND	ND	0.04	0.04
Total Phosphorus	0.46	0.43	0.43	0.11	0.25	0.24
Dissolved Phosphorus	0.39	0.35	0.12	0.14	0.18	0.15
Total Ortho-phosphate	0.47	0.48	0.11	0.13	0.21	0.22

[(1)]Total Nitrogen is the sum of TKN, nitrate, and nitrite. The detection limit is used for ND values.
[(2)]J flag indicates detected at a concentration below the RL and above the MDL, reported value is estimated.

Table 10. Analytical Chemistry Results for 3O_VAND.

	Dry Event #2		Wet Event #1		Wet Event #3	
Constituent (mg/L)	Dry #1	Duplicate	Wet #3	Duplicate	Wet #3	Duplicate
Total Suspended Solids	4.3	3.0	36	29.7	63.3	61.2
Total Dissolved Solids	660	649	157	224.4	208	204
Total Nitrogen[(1)]	1.8	1.8	5.4	2.41	6.51	6.68
Ammonia as Nitrogen	0.13	0.09	0.61	0.28	2.88	2.67
Total Kjeldahl Nitrogen	1.4	1.4	3.2	1.27	4.34	4.51
Nitrate as Nitrogen	0.32	0.28	2.1	1.11	2.04	2.04
Nitrite as Nitrogen	0.1	0.1	0.14	0.03	0.13	0.13
Total Phosphorus	0.46	0.45	0.49	0.42	0.52	0.47
Dissolved Phosphorus	0.38	0.38	0.36	0.32	0.24	0.25
Total Ortho-phosphate	0.35	0.34	0.43	0.39	0.13	0.11

[(1)]Total Nitrogen is the sum of TKN, nitrate, and nitrite. The detection limit is used for ND values.

Data Summary

A summary of the analytical chemistry results for 1O_ACAD is presented in Table 11 and the summary for 3O_VAND is presented in Table 12. The field measurement results for the seven sites are presented in Tables 13 through 19. Lab reports corresponding to analyses performed for each event, signed by the laboratories' Project Manager, are included in Attachment 3: Lab Reports.

NUTRIENTS AND SOLIDS DATA

Analytical results for nutrients and solids are summarized in Table 11 for site 1O_ACAD and Table 12 for site 3O_VAND. For 2012-2013 site 2O_SCBG was dry.

Table 11. Analytical Chemistry Results for 1O_ACAD.

	Dry			Wet		
Constituent (mg/L)	Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Total Suspended Solids	30	13	ND	32	16	23
Total Dissolved Solids	1290	1170	849	223	431	620
Total Nitrogen[1]	5.0	0.43	1.6	2.3	3.0	2.2
Ammonia as Nitrogen	0.32	0.04	0.08	0.24	0.13	0.22
Total Kjeldahl Nitrogen	1.2	0.43	0.40	1.2	2.1	1.2
Nitrate as Nitrogen	3.8	ND	1.2	1.1	0.93	1.0
Nitrite as Nitrogen	0.02J[(2)]	ND	ND	0.03	0.04	ND
Total Phosphorus	0.46	0.29	0.43	0.45	0.25	0.27
Dissolved Phosphorus	0.39	0.22	0.12	0.32	0.18	0.12
Total Ortho-phosphate	0.47	0.28	0.11	0.41	0.21	0.18

(1) Total Nitrogen is the sum of TKN, nitrate, and nitrite. The detection limit is used for ND values.
(2) J Flag indicates detected at a concentration below the RL and above the MDL, reported value is estimated.

Table 12. Analytical Chemistry Results for 3O_VAND.

	Dry			Wet		
Constituent (mg/L)	Event #1	Event #2	Event #3	Event #1	Event #2[(2)]	Event #3
Total Suspended Solids	4.7	4.3	5.7	36	---	63
Total Dissolved Solids	510	660	1839	157	---	208
Total Nitrogen[(1)]	0.9	1.8	2.2	5.4	---	6.5
Ammonia as Nitrogen	0.04J[(3)]	0.13	0.04	0.61	---	2.9
Total Kjeldahl Nitrogen	0.92	1.4	2.10	3.2	---	4.3
Nitrate as Nitrogen	ND	0.32	0.11	2.1	---	2.0
Nitrite as Nitrogen	ND	0.1	ND	0.14	---	0.13
Total Phosphorus	0.36	0.46	0.20	0.49	---	0.52
Dissolved Phosphorus	0.27	0.38	0.15	0.36	---	0.24
Total Ortho-phosphate	0.24	0.35	0.08	0.43	---	0.13

(1) Total Nitrogen is the sum of TKN, nitrate, and nitrite. The detection limit is used for ND values.
(2) Autosampler stolen; no sample available.
(3) J Flag indicates detected at a concentration below the RL and above the MDL, reported value is estimated.

FIELD PARAMETER DATA

Field data collected during wet and dry events for 2012-2013 are summarized by monitoring site in Table 13 through Table 19.

Table 13. Field Measurements for 1O_ACAD.

Parameter/ Constituent	Units	Dry			Wet		
		Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Flow	cfs	0.008	0.003	0.001	0.03	0.06	0.01
pH	S.U.	8.03	7.87	7.65	7.93	7.95	7.82
Temperature	°C	23.8	17.8	16.2	16.4	15.8	12.80
Dissolved Oxygen	mg/L	8.3	9.03	9.64	9.61	9.7	10.37
Turbidity	NTU	20.4	2.4	0.0	10.0	0.0	0.9
Conductivity	µmho/cm	2210	2003	1704	392	465	1034

Table 14. Field Measurements for 1O_EAST.

Parameter/ Constituent	Units	Dry			Wet		
		Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Flow	cfs	dry	dry	dry	dry	0.28	dry
pH	S.U.	dry	dry	dry	dry	7.77	dry
Temperature	°C	dry	dry	dry	dry	15.4	dry
Dissolved Oxygen	mg/L	dry	dry	dry	dry	9.68	dry
Turbidity	NTU	dry	dry	dry	dry	72.0	dry
Conductivity	µmho/cm	dry	dry	dry	dry	265	dry

Table 15. Field Measurements for 2O_SCBG.

Parameter/ Constituent	Units	Dry			Wet		
		Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Flow	cfs	dry	dry	dry	dry	dry	dry
pH	S.U.	dry	dry	dry	dry	dry	dry
Temperature	°C	dry	dry	dry	dry	dry	dry
Dissolved Oxygen	mg/L	dry	dry	dry	dry	dry	dry
Turbidity	NTU	dry	dry	dry	dry	dry	dry
Conductivity	µmho/cm	dry	dry	dry	dry	dry	dry

Table 16. Field Measurements for 3I_NORMP.

Parameter/ Constituent	Units	Dry			Wet		
		Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Flow	cfs	0.2	0.2	0.5	11	40	2
pH	S.U.	8.65	8.32	8.23	7.79	7.86	7.55
Temperature	°C	21.6	17.6	16.9	16.3	16.3	12.84
Dissolved Oxygen	mg/L	9.5	8.94	9.17	9.25	9.4	9.36
Turbidity	NTU	<0.2	<0.2	4.2	25.0	84.0	213
Conductivity	µmho/cm	1880	2105	2371	223	137	547

Table 17. Field Measurements for 3I_ASHB.

Parameter/ Constituent	Units	Dry			Wet		
		Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Flow	cfs	0.02	0.006	0.01	0.5	2.05	0.8
pH	S.U.	8.44	8.32	8.35	7.82	8.01	7.64
Temperature	°C	23.9	17.7	15.3	15.5	16.4	12.94
Dissolved Oxygen	mg/L	8.0	8.69	9.53	9.63	9.5	9.96
Turbidity	NTU	<0.2	<0.2	0.0	11.9	97.7	33.5
Conductivity	µmho/cm	748	703	788	237	89.0	262

Table 18. Field Measurements for 3O_VERSEP.

Parameter/ Constituent	Units	Dry			Wet		
		Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Flow	cfs	0.4	0.2	1.0	9	12.3	1.5
pH	S.U.	9.73	9.00	8.36	7.85	8.0	7.82
Temperature	°C	26.3	17.2	15.7	14.7	15.8	9.42
Dissolved Oxygen	mg/L	20.2	16.9	12.97	9.53	9.5	10.18
Turbidity	NTU	<0.2	5.5	0.0	25.7	20.6	34.9
Conductivity	µmho/cm	1800	1980	2424	204	267	312

Table 19. Field Measurements for 3O_VAND.

Parameter/ Constituent	Units	Dry			Wet		
		Event #1	Event #2	Event #3	Event #1	Event #2	Event #3
Flow	cfs	0.01	0.03	0.3	0.4	1.0	0.2
pH	S.U.	9.80	10.09	9.95	7.84	7.90	7.80
Temperature	°C	25.7	17.1	25.2	15.4	16.4	9.78
Dissolved Oxygen	mg/L	12.1	14.8	16.06	9.18	8.3	9.03
Turbidity	NTU	<0.2	4.0	6.7	34.1	82.7	30.8
Conductivity	µmho/cm	1030	1109	3480	176	160	282

The base flow at each site can be estimated using the measured flow data. The median dry weather flow for each site is presented in Table 20.

Table 20. Estimated Base Flows for the Sampling Locations.

Location	Base Flow (cfs)
1O_ACAD	0.003
1O_EAST	Dry
2O_SCBG	Dry
3I_NORMP	0.2
3I_ASHB	0.01
3O_VERSEP	0.4
3O_VAND	0.03

PRECIPITATION

Precipitation measured for the 2012-2013 storm season from several gauges surrounding the watershed are presented in Table 21. The storms sampled as part of the Year 1 nutrient monitoring are called out in the table with shading. The average rainfall within the watershed is approximately 12 inches for Island 3 and 14 inches for Islands 1 and 2. As is evidenced by the total precipitation listed in Table 21, rainfall in the 2012-2013 wet season is significantly below average.

Table 21. Precipitation Measured at Rain Gauges in the Machado Lake Watershed and Surrounding Area. Precipitation Events Corresponding to the Year 1 Wet Events are Shaded.

Storm and Date		Storm Days	Gauge (inches)				
			KCA-TORRA[1]	LAX[2]	LGB[3]	Dominguez[4]	Redondo[5]
1	10/11/12 – 10/12/12	2	---	0.11	0.30	0.80	---
2	11/8/12	1	0.12	---	0.12	0.12	---
3	11/16/12 – 11/17/12	2	0.27	0.29	0.16	0.15	0.27
4	11/28/12 – 12/3/12	6	0.77	1.25	1.41	0.86	1.01
5	12/12/12 – 12/14/12[6]	3	0.23	0.14	0.30	0.21	0.19
6	12/18/12	1	---	0.21	0.16	0.13	0.18
7	12/22/12 – 12/24/12	3	0.39	1.47	0.98	0.69	0.74
8	12/26/12	1	---	0.44	0.12	0.13	0.10
9	12/29/12	1	0.42	0.28	0.16	0.21	0.37
10	1/6/13 – 1/7/13	2	0.10	0.13	---	0.11	0.14
11	1/23/13 – 1/27/13[7]	5	1.21	1.10	0.98	0.98	1.37
12	2/8/13	1	0.16	---	0.15	---	---
13	2/19/13 – 2/20/13[8]	2	0.03	0.13	0.15	0.08	0.07
14	3/7/13 – 3/8/13	2	0.57	0.66	0.85	0.63	1.15
	Total	32	4.27	6.21	5.84	5.20	5.59

[1] KCATORRA 18 Weather Wunderground
[2] Los Angeles International Airport
[3] Long Beach Airport
[4] Dominguez Yard
[5] Redondo
[6] Wet Event #1 sampled from 12/12/12 through 12/13/12
[7] Wet Event #2 sampled from 1/24/13 through 12/25/13
[8] Wet Event #3 sampled from 2/19/13 through 2/20/13

Summary

Wet and dry events for the Year 1 Nutrient Monitoring for the Machado Lake Watershed were performed successfully. With the exception of Wet Event #2 where an auto-sampler was stolen from the 3O_VAND monitoring site, all water quality samples were collected as specified in the MRP. There were generally no deviations from the MRP during sampling events. All sites were visited; field measurements were collected at all sites except where flow was not present. For storm sampling, composite water quality samples were collected for entire duration of each storm. Dry event samples were collected as grabs. For both wet and dry weather sampling, QA/QC duplicate (identified as DUPREE in the filed log), as well as a QA/QC field blank (identified as TAHOE in the filed log) were routinely collected. The QA/QC analysis showed that all collected data should be accepted with the limited exceptions as noted in the text. No field limitations other than security of the composite sampling equipment were identified and therefore no modifications to the MRP are suggested.

Attachments embodying the details of individual sampling events include the following:

Attachment 1: Field Log Book
Attachment 2: Site Photographs
Attachment 3: Lab Reports
Attachment 4: Police Report for Stolen Auto Sampler

Raw data in excel format for analytical chemistry and field measurements are concurrently submitted in electronic format.

The total nitrogen load from the County Islands is estimated to have been 808 kg/year, and the total phosphorus estimated to be 134 kg/year for the 2012-2013 period. Both total nitrogen and total phosphorus loads are estimated to be lower than the interim limitations effective March 11, 2014.

Attachment 1: Field Log Books

Attachment 2: Site Photographs

Attachment 3: Lab Reports

Attachment 4: Police Report for Stolen Auto Sampler